

Fig. 2.



Fig. 1.

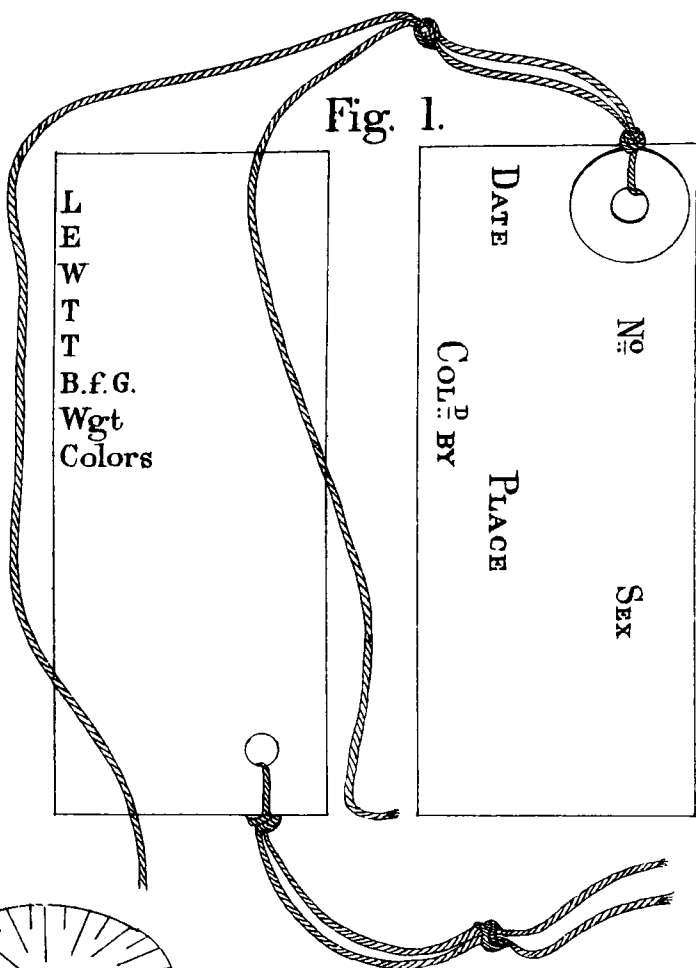


Fig. 3.

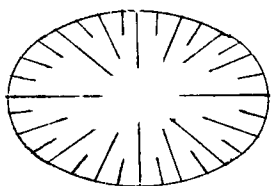
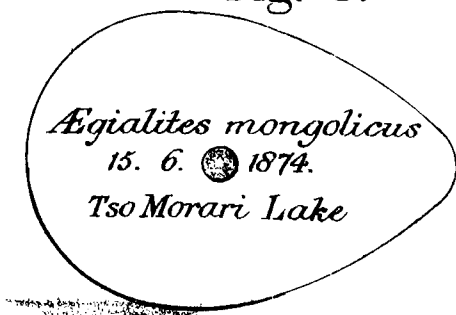
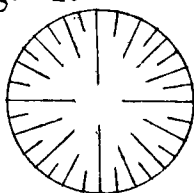


Fig. 4.



THE  
INDIAN  
ORNITHOLOGICAL COLLECTOR'S  
VADE MECUM:

CONTAINING  
BRIEF PRACTICAL INSTRUCTIONS FOR COL-  
LECTING, PRESERVING, PACKING, AND  
KEEPING SPECIMENS  
OF  
BIRDS, EGGS, NESTS, FEATHERS,  
AND  
SKELETONS.

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BY  
ALLAN HUME.

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PRICE ONE RUPEE.

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## PREFACE.

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FROM time to time I have written and printed various notes, on the subjects dealt with in this little pamphlet, for the use of gentlemen who have collected for me.

Of late I have been *continually* applied to for copies of these notes, which however have long been exhausted, so much so that I have had to borrow copies in order to enable me to reprint them in this collected form.

I do not know that they were worth this ; but, at any rate, any one who requires copies can now obtain them in a compact and portable form by applying to the Publisher.

A. O. H.



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THE  
INDIAN  
ORNITHOLOGICAL COLLECTOR'S  
VADE MECUM.

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I. Birds.

1.—*Materials and instruments necessary or useful for skinning and preserving.*

---

IN preserving birds the great point is to use good arsenical soap and to use plenty of it.

Fifty receipts are given for arsenical soap, but after many years' experience I am perfectly confident that the best of all preparations consists of equal parts of good white English bar-soap and arsenic (the white arsenious acid, *sunkya* of the bazaars) worked up together with sufficient turpentine to make a tolerably stiff paste, some camphor, say about  $\frac{1}{4}$  of the weight of the soap used, being thrown in and worked up along with the other ingredients.

If this mixture ever gets stiff and hard the brush with which the arsenical soap is to be applied to the skin can be dipped in turpentine instead of in water, or the whole lump of paste



can be worked up again with a little turpentine, when it will be as good as ever.

It is a great mistake, as I have now proved, to put either lime or corrosive sublimate into the soap, because they certainly have a tendency to render skins, after a few years, brittle, and the thinner the skin the sooner does this result become apparent, whereas skins thoroughly anointed with the mixture I recommend, remain comparatively flexible for a very long period and never seem to grow brittle.

Another point is use plenty of the soap. You can make up as much as you please for yourself at a cost certainly not exceeding Re. 1 a pound, and it is the worst possible economy to save in arsenical soap.

The fact is that insects can scarcely be persuaded to attack thoroughly poisoned skins, and nine times out of ten when people complain of the difficulty of preserving specimens this will be found to be due solely to the perfunctory manner in which the soap has been applied.

People take the ordinary arsenical soap sold in the shops, which contains about one part of arsenic out of four or five, then make up a thin lather of this with water and brush the skin over thinly. A week afterwards if you examine the skin you may find about one speck of arsenic to every square inch of skin, and this too so little adherent that a little shaking will dust it all off into the cotton wool stuffing. How any one can expect such a process to protect skins, if *really exposed* to the attack of insects, I cannot imagine; the birds may look all right, and if protected from the

*approach* of insects may of course keep for ever, but if insects get at them there is nothing to repel their ravages.

If birds are to be fairly safe they must be treated very differently, and a skin when cut open should appear as if it had a thin coat of white wash, firmly adherent to the skin, the natural result of applying the arsenic along with a copious supply of soap and turpentine.

In preparing the composition recommended, the soap (not native bazaar stuff, but good white English bar-soap), should first be shredded very fine, and should then be very thoroughly worked up with the powdered arsenic in a large mortar, the turpentine and camphor being added from time to time. Any native can prepare it as well as the best chemist; elbow grease is all that is required. He must work it, work it, work it, until it is smooth, soft and even as thick cream; as for the quantity of turpentine this cannot be exactly stated, but it should be added gradually and only just so much as may be found necessary to convert the whole into a fine thick cream.

The arsenic must be very finely powdered, this, mind, is all important, but as the dust is likely to be carried up into the nostrils, eyes, &c., and do great harm, it should always be ground with just sufficient turpentine to prevent the possibility of any particles flying up and being inhaled, &c.

In regard to the arsenic, it may be noted that there is a method of reducing it to a powder far finer than can be obtained by mechanical trituration, and that is by sublimation. Place the arsenic in a large empty "*gharra*" or earthen

water-pot. Invert another similar pot over the former, closing the line of juncture with fine clay, or *chicknee muttee* as it is termed in Upper India. Then place the apparatus on the fire, and expose it to a mild heat. The arsenic will be sublimated, and after an hour, the apparatus being allowed to cool, the arsenic will be found adhering in a fine crust to the roof, in other words the bottom of the upper pot, from which it can be at once removed in a truly impalpable power. This though rather more trouble is by far the best plan to adopt.

I recommended every one to make their own arsenical soap, utilizing the skilled agency of the nearest native compounder, when one is available. When ready, large brown glazed jars, such as can be procured in any bazaar, are the best things to keep one's stock in. Out of these small tin boxes can be filled from day to day for daily use.

Spirits of turpentine are most useful for destroying insects and their eggs, and a bottle of this should be, if possible, always at hand to be used as hereafter noticed.

Bran prepared after the following fashion is useful, and a stock of it, ready for use, may always be kept with advantage. Take half a maund of bran and place it in a very large cooking pot or a large "*nand*" or deep earthen vessel, get a bheestie to pour water on it keeping it well stirred; pour the water off; repeat the process five or six times until every particle of *jari-naceous* matter has been carried off, and the water comes away perfectly pure; thoroughly dry the

residue of brown scale-like husks, and keep in a tin box ready for use.

Pure carbolic acid, which except in warm localities is crystallized and pure white, should always be at hand. It is constantly required for a dozen different purposes, and, without its free use, it is impossible to obtain specimens of very large birds entirely free from all unpleasant smell.

Wood ashes are indispensable, but these can generally be procured any where in India at a moment's notice to any extent; for a sea trip a large stock should be taken.

For instruments two or three *sharp* penknives of sizes or dissecting knives, three pairs of scissors, one large, one medium, and one small sharp pointed pair (such as are called embroidery scissors), a few good needles of sizes, a pair of forceps, and a hone (for the knives *must* be kept sharp) are sufficient, but either a tiny saw or a pair of pruning scissors, (such as are now-a-days used by gardeners, and can be purchased at Thomson's, Esplanade Row, Calcutta, and doubtless other hardware dealers), are very useful for cutting the large bones of large birds. Strong sewing thread, and fine pack thread for large birds, and a couple of brushes, one a large paint brush, the other a moderate-sized shaving brush, will be required for laying on the arsenical soap.

Sometimes, when feathers will not set well in a dried skin, it is necessary to pull them out, cut off the quill ends, and gum them into their places again; at others feathers become detached and have to be replaced. This can be done with paste

mixed with a little corrosive sublimate, but the following is a good receipt for a fixing cement :—

Gum Arabic	...	...	4 oz.
Sugar-candy	...	...	1 „
Garlic (if you like) a few cloves.			
Arsenical soap	...	...	$\frac{1}{2}$ oz.
Starch	...	...	4 „
Water	...	...	8 or 10 „

Boil the whole well together, and this cement will be found to answer famously.

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## 2. *Collecting, carrying and keeping the fresh birds.*

---

I do not propose here to enter into the question of noosing, netting, and trapping birds. It is not that I undervalue these important aids to a collector, but that in the first place scarcely any European collector in India has the time for this kind of work; secondly, if he desires to have birds netted or snared he will generally be able to pick up native fowlers who can do this kind of thing a great deal better than he will ever learn to do it himself; and thirdly, because I myself have never had any practical experience of this kind of work in India.

At the same time the late Captain Beavan, undoubtedly, used to catch hundreds of the small graminivorous birds in the neighbourhood of Simla with an ordinary overfall pull net, such as bird-catchers in England commonly use, and any one who has time and has had practise as a boy in using such a net might obtain, I believe, great assistance in collecting, by its judicious use.

As a rule, in India, we may assume that every collector will have to shoot the great majority of the specimens he wants to preserve, or at best will have to get them shot by a native shikaree. In some parts of the country, especially where any aboriginal tribes exist, a vast number of birds may be obtained, captured by nets and snares, and wherever this is the case the collector should utilize the opportunities thus afforded to the fullest extent; but, as a rule, his main standby must be the gun, and in regard to this I shall only say that for collecting purposes a breech-loader is incomparably superior to a muzzle-loader.

Of course the less injured a bird is in killing it the better skin it makes. The moment a bird is shot, it should be carefully picked up by the feet or beak, and if still alive not allowed to flutter and bedaub itself with mud or blood. The feet, beak, and wings should be firmly held, and, if it is a small bird, it can be killed by pressing firmly with the thumb on the breast and forefinger on the backbone, and so either crushing in the sternum or breaking the backbone; a cloth or handkerchief ought to be used to prevent perspiration or dirt from the finger soiling the feathers; care must be taken to press on the upper portion of the breast and not too far back, as otherwise the pressure will often cause the entrails to protrude through the vent. When thus killing a bird (which if properly done ought not, where the bird is not larger than a pigeon, to take more than a minute) it should be held nearly horizontal with the back uppermost, so that any discharge from the vent in the last struggle may fall straight

on to the ground, and not soil or bedaub the lower tail-coverts, &c. Where the bird is very large it should, if possible, be killed with prussic acid or cyanide of potassium. But these are dangerous things to carry about, and very often cannot be kept in hand on the march. In such cases the wings, beak, and feet being firmly held the bird should be laid on its *breast*, on a piece of cloth stretched on a smooth stone or piece of ground, and strong pressure exerted on the upper back. If a bird is only the size of a kite or large duck this can be done with the hands, but in the case of eagles, vultures, geese and the like, a man must stand on the bird throwing all his weight on to the one foot he stands on. Whether hands or feet are used a cloth or handkerchief should first be placed on the back to prevent injury to the plumage. The bird must not be allowed to struggle, the pressure must be direct and steady, not wavering in the least, or the feathers will get rumpled, the foot must be placed well forward, (otherwise as before noticed the entrails may protrude through the vent) and the feet must be held up on each side of the tail, which they will thus lift and prevent coming in contact with any discharge. It is to avoid this that the bird is laid on its breast and not on its back.

There is another and more efficacious and rapid way of killing large birds, which however requires a little knack. A strong needle, mounted with a round wooden knob, such as sail-makers use, is pressed into the middle of the back of the skull, just above the occiput, well into the brain, pointing towards one eye, and immediately by a

turn of the hand is made to sweep through the brain and point to the other eye. Properly and rapidly done, death is almost instantaneous, and not a drop of blood escapes by the minute needle hole in the skull which can moreover, if necessary, be plugged on withdrawal of the needle.

The bird dead, all the feathers should be at once carefully smoothed, any shot holes plugged, *sand* (not dust) sprinkled on any place from which blood seems oozing, shaken off when saturated, again sprinkled, and so on, until the issue seems stopped. In the case of blood issuing from mouth, nostrils, ears or eyes, these should be firmly plugged with cotton wool, after having been dried, as much as possible, with sand.

For carrying all small birds I take a rod about 3 feet long, and at distances of 3 to 4 inches apart tie on pieces of string each with two ends loose; to one end I tie a good sized pin by the head, to the other a slice of a common cork about half an inch thick, so that the cork hangs about 2 inches below the rod, and the pin, when held horizontally, is just opposite the centre of the cork. The pin is run through the nostrils of any small bird we have to carry, and the point pushed firmly into the cork. Thus suspended, ten or twelve small birds can be carried, by any cooly, in one hand, without any injury to the plumage being possible. Larger birds cannot be thus treated, their weight in some cases might break the nostrils, in all would unduly stretch the neck. These should be hung by the feet by loops attached to a rather stouter rod, a strip or two of rag or cloth, about 3 inches wide, being pinned round them, so as to keep



the wings closed tight against the body, and prevent their flapping about, getting caught in the bushes and jungle in passing, and rubbing up and down against and so injuring each other.

It sometimes happens that the naturalist has no companion, and must perforce carry his birds himself; in this case, *after most carefully plugging mouth, nostrils, and shot holes*, and placing sand or a piece of cotton over any bloody place, he should make a cone of paper (which a single pin put in the proper place will suffice to do), and then drop the bird carefully into the cone head foremost; the broad portion of the cone is then to be carefully folded in round the hinder part of the bird, and the folds secured with a second (or if necessary a third or fourth) pin.' Thus packed, the bird will travel uninjured in game bag or pocket, but the plugging is an essential part of the business, as otherwise water or blood is sure to run out of the mouth, &c., and greatly injure the plumage. If the eyes or ears are injured they must similarly be plugged, and generally it is safest to stop them whether they are injured or not.

Birds decay so rapidly in the hot weather in India that it is well to know that decomposition can be greatly retarded by a very simple process. Drop carbolic acid from five to fifty drops according to size (directly after the bird is shot if possible, if not as soon as you conveniently can), down the birds throat. Take a good plug of cotton, dip one side into carbolic acid, and push it that side downwards well into the *gullet*. Take another similar plug, well saturated in carbolic

acid, and push it into the vent. Birds thus treated may be kept for 48 hours in the hottest and dampest climates. Great care is requisite on two points; first, remember that the smallest drop of the acid in the eye permanently destroys the eyesight; secondly, that it takes the color out of (bleaching yellow for instance white), and injures the feathers, over which it must not be allowed to run.

If carbolic acid is not at hand divide the skin of the belly, taking care not to soil the plumage, extract the whole contents of the body, dry the cavity as much as possible with rag or sand (taking care that no flies get in during the operation) and then cram the cavity with powdered charcoal, sewing the opening loosely together. Care must be taken that not only the entrails liver, &c., are taken out, but that the *crop* also is thoroughly emptied. The body filled up, the mouth should be opened, and as much powdered charcoal forced into it and the throat as possible. The mouth should then be tied up. This whole operation can be performed in ten minutes in the case of even the largest birds, and is a tolerable substitute for the use of carbolic acid.

In every case, in handling birds, whether to kill them or when about to stuff them, or for any other purpose, always remember, when laying them down on their backs, to *push* them gently by the feet, head foremost, a few inches along the cloth, as this smooths all the feathers, and never, in measuring them or any thing else, *pull* them the other way, as this greatly injures the feathers.

When leaving birds for a time, till ready to stuff them, always lay them on three or four folds of blotting paper or cotton cloth (an old sheet or table cloth doubled for instance) because liquid often escapes from the mouth, eyes, &c., even after a bird has lain for many hours, and then if the bird is lying, as above directed, the liquid is absorbed, and no harm is done, whereas if it is resting on common paper, or on a bare table, or any other non-absorbing surface, the liquid runs on it and accumulates, and almost inevitably soils the feathers.

Persons employing shikarees and stuffers are often at a loss to know how much they ought to expect from these. Taking birds, big and little together, one shikaree ought to shoot and one stuffer preserve at least 180 good specimens in a month. Three pounds of good English powder, and 18 lbs. of shot (2 lbs. B.B., 4 lbs. No. 3, 6 lbs. No. 6, and 6 lbs. No. 10) and 400 caps, will give as nearly as possible 300 charges (only half charges are used with small birds) with which a decent shikarree, allowing for misses, mangled and lost birds, should procure at least 180 good specimens. Good men will bring as many as 250, and a single native stuffer on one occasion preserved above 450 birds for me in one month. No man who cannot do 180 in a month *well* is worth retaining: of course where good ones are not to be got, shift must be made with those that can be got.

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### 3.—*Ticketing and measuring the fresh birds.*

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It is absolutely essential that every specimen preserved should bear a ticket, on which should be recorded at least the date and the place at which the specimen was obtained and the collector's name. It is very desirable that other particulars, of which more hereafter, should also be recorded, but before entering more particularly into this part of the question I want to say a few words as to the kind of ticket that should be used.

After trying innumerable forms of ticket and all kinds of materials for them, I have formed a very decided opinion as to which is the best that can be devised, and I give, *vide* Fig. 1, a *fac-simile* of the one I now use.

Let me premise that ordinary paper does not do, it continually tears or the thread by which it is attached to the legs drags or cuts through it, and thus the tickets are lost. Card, such as most people now-a-days use, especially the ponderous pieces of paste board that European ornithologists appear to delight in, are ruinous to the feathers of moderate-sized birds, and sooner or later in taking the bird in or out of its case drag off a leg, or crumple up tender feathers almost hopelessly. Parchment is not so bad as card, but it is still too harsh for the feathers of delicate birds, and it is so difficult to write on, that no field naturalist, who has to measure and ticket and record the colors of the soft parts of perhaps twenty birds after a hard days work, can possibly use it.

Wire is often used for fastening on the tickets,

but if thick it is too heavy, and if thin it has a great tendency to cut the legs off.

The material I use is thin, but very tough bank paper, so soft that it will not hurt the most delicate feathers, and so tough that it is not likely to tear across.

My tickets are 2·5 inches long and 1 inch wide. To prevent the string by which the ticket is attached cutting through the paper, I cut with an ordinary No. 32 wad-cutter a disc of card 0·4 inches in diameter, and gum this firmly on to one corner of the ticket, as shown in the figure; through the centre of this disc and the paper on which it is gummed, I cut a small circular hole with an ordinary punch clip, such as saddlers use for cutting holes in straps.

To attach the ticket I use strong, pretty thick crochet-cotton; this never breaks, never comes untied of itself, can always be untied when required, and does not cut the leg. I pass the cotton through the hole above described, and then knot it firmly against the margin of the disc; then I make another knot in the cotton an inch further up, and then the ticket is ready to be tied on. The second knot is made so as to allow the ticket to be easily lifted and read on both sides without untying it or working it backwards and forwards on the legs, and also to enable it to lay flat down on the tail instead of sticking up at right angles to the legs, as tickets tied without this second knot always do, thus moreover courting abrasion and injury.

It will be seen that on one side of the ticket there are places for the insertion of a number and

of the sex ; then there is a broad space in which the name can be inserted ; then places for the date and the name of the locality and the name of the collector. This side of the ticket *must* in every case be fully filled up.

The other side of the ticket is for the record of other particulars, which, though extremely desirable, are yet not absolutely essential.

Here "**L**" stands for length. The length of the bird is ascertained by laying it lengthwise head and tail along a measure ; and then pulling it gently by the beak until the point of this latter exactly reaches the zero point or end of the measure, then the tip of the longest tail feather will indicate on the measure the "length" that is to be recorded.

"**E**" stands for expanse. Lay the bird on its back crosswise on a measure, and stretch out both wings to their utmost extent. The length of measure included between the extreme tips of the two wings is the "expanse" to be recorded.

"**T**" stands for tail, and the distance from the vent to the point of the longest tail feather is to be recorded opposite this.

"**W**" stands for wing. The measurement here required is from the point of the carpal joint to the end of the longest primary, the measurement being made on the under surface of the wing with the wing pressed flat on the table. It is essential that the wing should be pressed flat, because in some large birds, with much bowed wings, there will be a difference of 3 inches between measurements made outside along the curve, and inside along the chord.

“**Ts.**” stands for tarsus, and here the length of the tarsus should be recorded, being measured at front, from the joint, to the depression between the rounded end of the tarsus, and the articulating portion of the first joint of the mid-toe.

“**Bfg.**” stands for bill from gape. This is measured straight from the angle of the gape to the tip of the upper mandible.

“**Wgt.**” stands for weight. This should be recorded in lbs., ounces, and decimals of ounces, Avoirdupois. All measurements should be in English inches and decimals thereof.

“**Colors.**”—Under this head should be recorded the color of all the soft parts; of bill, cere, bare skin about the head and neck, irides, eyelids, and orbital skin, if bare, legs, toes and claws.

The space allotted on my ticket is quite sufficient for the record of these particulars in the case of nine birds out of ten if the entry is neatly made; but some few birds necessitate an elaborate description of the colors of the soft parts; in this case, the description should be entered in the appropriate page of the ledger journal, (*see p. 55*) and a reference to this made on the ticket.

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#### 4.—*Skinning Birds.*

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To skin birds first remove from the mouth, throat, nostrils, &c., any plugs previously put in. Hold the bird up head downwards, open the mouth and allow any blood or liquid that may have accumulated in the throat, &c., to run out, compressing the body gently the while. Then

stuff the mouth with cotton, in large birds taking care to fill the wool well into the division at the back of the roof of the mouth. Tie the mouth up tightly, passing a strong thread once or twice under the lower mandible and *through* the nostrils. Then stuff the nostrils tightly with cotton. In birds that have large ear orifices stuff these also with cotton wool, especially if the bird has been wounded about the head. Where birds have been shot through the eyes, these too must be plugged with little pieces of cotton rag introduced inside the lids. Where the bird is large and the eyes have been much injured the best plan is to remove the eye-balls at once. Cut a square piece of bone out of the palate, so as to break into the backs of the sockets. Through the holes thus made the eye-balls can be pulled out through the mouth, after which the sockets are to be tightly stuffed with cotton.

The object of all these precautions is to prevent blood and other liquids escaping from these various openings, and soiling the plumage, when, in the course of skinning, the skin is turned inside out over the head.

Some people, and perhaps this is the best plan, always extract the eye-balls before they commence skinning. They thrust one of those large curved-pointed broad-bladed packing needles, from outside into the socket under the ball, taking care not to pierce the crystalline lens, and with a downward turn of the hand jerk the eye-ball out. This is very easily done with a little practice, and entirely obviates all bleeding from the eyes during the time that the skin is reversed over the head.



The sockets empty, cut away the palate with a pair of sharp-pointed scissors, and then plug the whole space inside, including the sockets, tightly with cotton.

This has one great advantage ; it obviates the necessity of plugging the nostrils from outside, which operation too often distorts and distends these.

The bird, thus prepared, is to be laid on a cloth on its back, with the tail towards the operator, and the feathers having been first carefully divided, that is to say pushed aside to the right and to the left, a clean cut is to be made in the skin along the centre of the breast right down to the vent. The exact spot where this cut ought to commence must depend upon the skill of the operator. A novice had better cut from about the middle of the sternum or breast-bone, but with practice, birds can be well skinned with only an opening from the lower end of the breast-bone, and of course when it can be done, this is the best way, since the smaller the opening in the skin the better.

Care must be taken in making this first cut, at any rate that portion of it which is over the belly, not to do more than divide the skin. In many birds the muscular covering of the intestines, &c., is by no means thick, and a careless cut, if at all deep, will open these as well as the skin and give a great deal of trouble.

The incision made, the skin on one side is to be gently separated from the flesh below, the end of a small paper-cutter or tooth brush being used to facilitate the operation, if necessary, but generally the fingers suffice.

This raising of or separating the skin is in some birds a very easy, in some a very difficult operation. Where the bird is small and the skin delicate the greatest care and gentleness is necessary, while in many kinds of birds the skin may be pulled and tugged at without danger.

Practice alone will teach the amount of care required; beginners should in every case be as gentle as possible. In raising or separating the skin from the flesh it will often be found necessary to score the skin, just where it remains adhering to the flesh, with a sharp penknife. Such scoring must not be deep enough to divide the skin, but only to divide the fine ligamentous membrane by which the skin is firmly attached to the muscles. A few *light* cuts, thus made with a sharp knife, will often enable a skin to be easily separated from the flesh, which would otherwise be inevitably torn in the process.

When by slow degrees the skin has everywhere on one side been separated from the breast, abdomen and sides, so that the finger (or hand in the case of very large birds), can everywhere be freely passed between skin and flesh, the other side of the bird is to be similarly dealt with. In all this process the greatest care is to be taken that the feathers do not turn inwards on the flesh and get bloodied or greased.

*The* thing here is to use wood ashes, and to use quantities of these, not a little, because then that only sticks to the feathers and dirties them, but handsful, so that every particle of raw surface, whether of skin or body, is covered with a veil of ashes, constantly renewed as it grows greasy by

absorption. I cannot too strongly insist on this, use wood ashes in all cases, but it is absolutely essential when greasy birds have to be skinned.

When the fingers can be everywhere passed between skin and flesh of the whole breast, belly and sides, one leg is to be taken and firmly pressed up inside, until, gently lifting the skin, the round knee joint is plainly visible inside, and the skin can be detached from round it. The bare leg should then be divided inside the skin at the knee joint, the flesh being cut through and the joint divided, care being taken that the skin at the back of the joint has been pushed away and separated from it, so that no portion of it gets cut at the same time as the joint muscles. The lower portion of the leg may then for the time be allowed to resume its original position, and taking hold of the thigh stump, the finger may now be passed outside this (separating the skin) round the one side of the rump, and half way across the back. The same process repeated with the other leg, side, &c., will leave the skin attached to the lower part of the body only by the tail.

Separate the skin from round the base of the tail as far as possible, and then cut through the root of the tail. Tie a string (of strength proportioned to the weight of the bird) firmly to the two thigh stumps, and by this hang the bird on a hook in front of you; the skin will then fall backwards from the lower part of the body, and may be gently turned down inside out over the body as far as the wings. The feathers on either side of the opening will have the greatest tendency to curl back into the inside surface of the skin and

soil themselves, and this can only be prevented by keeping the raw surface always thoroughly powdered.

Having gently pulled the skin down, inside out, over the bird as far down as the wings, the finger must be passed round the base of these, so that they can be cut through without touching the skin. This done the skin can now be dragged down, still inside out, over the neck, and over the head, until the whole bird hangs before you bare, with its whole skin hanging below it turned inside out, attached only at the points where at the base of the mandibles it has its origin.

In detaching the skin from the neck the knife will have constantly to be used, the ligamentous membrane which secures the skin in these parts being usually very tenacious.

Turning the skin back over the head will, in many birds, ducks and the like, prove, owing to the narrowness of the neck and the size of the head, an almost insuperable difficulty. There are two ways of overcoming this. The first is by cutting away from behind as soon as the base of the skull is exposed, the whole *internal* structure, leaving only the external wall of the skull; this will enable the skull to be compressed so that the skin can pass over it, and if this is properly done the skull will not be so injured that after thorough cleaning it cannot, when the skin has been turned back on it again, be stuffed out to its proper size.

The other way is, when the skin has been turned back to the base of the skull as far as it will go, to divide the skin of the throat, or better if there is a full crest, of the occiput and nape (after

most *thoroughly* powdering it, for the feathers *will* turn *in* at the cut) longitudinally, just sufficiently to allow the skin being passed over the head. This is the best method, and where this is adopted, when the head has been thoroughly cleaned and the skin is ready to be returned, the edges of the cut are to be caught together with strong thread run from side to side. This thread is to be kept loose until the skin *has* been returned, and then gently pulled until the edges of the cut truly meet, care being taken that none of the feathers get entangled in the thread or are allowed to remain turned into the cut. The feathers on either side are then adjusted over the cut, of which when neatly done not a trace is visible in the prepared specimen.

To return, the skull laid bare, it has to be thoroughly cleaned, the neck being cut close to its base, and the skin thus finally separated from the carcase. The brain pan, the opening to which may be enlarged as much as is necessary, is to be entirely emptied and cleaned out, and the eye-balls and nerves (if this has not already been done) removed from the orbits. In doing this the membranes attaching the eye-lids to the skull must be cut, but care must be taken not to split or injure the lids themselves. Similarly, the membranes attaching the skin to the aural orifices must be divided, and where the aperture is at all large the hole in the skin thus caused over each ear must be just stitched together to prevent its splitting at these points. The tongue and every particle of flesh must be removed, and in fact the whole skull cleaned thoroughly. Some

people to save trouble cut away the whole back half of the skull. This should never be done, as it very much injures the specimen, the mutilated head losing its character. Again in raptorial birds there is a projecting, more or less cartilaginous, shelf over the eye. This must never be cut away, as the absence of this in like manner destroys the character of the head. In large birds I always (if this has not been done to begin with), besides cleaning the skull, cut up into the roof of the palate and hollow out the whole of this portion of the head; there is a quantity of nervous tissue here which is apt to decay, and form a cradle for insects. The removal of this portion of the head in no way affects its external shape, and is, I think, in large birds very desirable.

The head, thoroughly cleaned; it should in all large birds be pretty freely saturated with carbolic acid to prevent any smell while drying, and should in all cases be thoroughly anointed with the arsenical soap, care being taken that this penetrates into every cranny. The skin of the head and neck is to be similarly anointed, and the orbits filled with cotton wool; the plugs of cotton previously placed in mouth, ears, &c., having of course been removed in course of cleaning the head. Then take a thin piece of bamboo or stick, say an eighth of an inch in thickness for small birds, a quarter of an inch thick for a crow, and fully half an inch thick for a vulture, measure it to the exact length of the body and neck, plus the length from the back of the skull to the middle of the palate, point this at both ends,

wind a little tow according to the size of the neck (always making it a little thinner than the neck) round the stick, and then wedge one point of the stick firmly into the palate, the other end will later be wedged into the tail bone. Many people find it most convenient not to turn the head back until they have also cleaned wings, feet, and tail; at any rate it is to be understood that before turning back the head this tow covered stick neck is to be firmly wedged in as above explained, the skin is then to be turned carefully back over the head and over this false neck, the end of which remaining inside the body can be, when all is ready, wedged into the tail bone.

The use of this stick very much diminishes the danger of the necks getting broken in packing, but is not necessary where the system to be described further on of bending the necks round is adopted.

Of course stick necks entail more trouble if the specimen is thereafter to be mounted, but no ornithologist worthy of the name would dream of mounting specimens. Mounted birds are all very well as playthings, but for any one who requires to *work* at birds they are not to be compared with unmounted ones. If the specimens are required to be mounted, the necks should be made simply of tow without the stick.

The skin returned, there are still the wings to attend to; take hold firmly of the cut end of the wing bone, and pulling gently turn the wing inside out as far as the further end of the double bones (*ulna* and *radius*). To one of these bones (the *ulna*) the roots of the secondaries are attach-

ed, and these require considerable force and the use of the nail in small, and of a paper-cutter in large birds, to detach them. Care should be taken, especially in large birds, to turn the skin right down to the carpal joint, and to clean away all flesh from this as well as from the double bones and the single larger one (the *humerus*) with which these articulate, and which connect these with the body. When all the bones are thoroughly clean they should be well anointed with the arsenical soap, a little tow should then be wound round them, rather less in bulk than the flesh that has been removed. The inside of the skin should then be also thickly anointed with the soap, and the wing pulled back into its natural position, and the ruffled quills and coverts carefully smoothed and readjusted in their proper places. The other wing being similarly treated, the inner bones of each are to be tied together, so that they remain exactly as far apart as they did when attached to the body of the bird.

This is necessary to ensure a proper *set* of the wings in the dry specimen. Some people to save themselves trouble remove not only the whole *humerus* or upper arm, but also the whole of the *ulna* and *radius*, which constitute the forearm. This practice should never be adopted, but at least half the *humerus* and the whole of the other bones should be retained.

In large birds, Eagles, Vultures, &c., besides this it will be necessary to clean the carpal joint of the wing, as there is a considerable amount of flesh on the *carpal* and *meta-carpal* (or hand) bones. This cannot be done from *inside*, and an incision



must therefore be made from outside on the inner surface of the wing, and the flesh cleared away, and plenty, first of carbolic acid, and secondly of arsenical soap, introduced by the opening thus made, which after the addition of a little cotton wool is to be neatly sewn up.

This carpal joint, popularly the shoulder of the wing, is the place of all others which in very large birds so commonly decays, but the free use of carbolic acid and the arsenical soap above recommended will entirely prevent this.

Then there are the legs; the head of the leg bone (the *tibia*) being taken hold of, the leg is to be pulled so as to turn the skin inside out, as far as it will go, which will be as far as there are feathers outside, and any flesh inside; only half way down the tibia in Cranes for instance, and right down to the feet in Eagles and some Owls, &c. Every particle of flesh is to be cleared away from the leg bones (which are on no account to be cut out), these are to be anointed with the soap, wrapped round with tow or cotton wool (not quite so much of this being put on as there has been flesh removed), the inside of the skin also anointed, and the leg pulled back into its proper position.

In large birds, such as Eagles, Vultures, Lammergeyers, &c., the feet have to be specially attended to; a longitudinal cut must be made along the centre of the sole of each toe from end to end, and the whole of the sinew and nerve removed from round the bones of each toe and from the ball and heel of the foot, the whole inside must be dosed with carbolic acid and then anointed

profusely with the soap, a little tow introduced in place of the substances removed, and the cuts sewn up. The whole exterior must then be thickly anointed with the soap.

In very damp climates it may be well a day or two later to soak the feet for at least 5 minutes in a weak corrosive sublimate solution, plunging them in, right up to the feathers. I don't much like this, for reasons already explained; but it leads to their drying in about  $\frac{1}{3}$ rd of the time they otherwise would.

In the case of long-legged birds, like Cranes and Bustards, which have large tarsi with thick back sinews, I open the tarsus all the way down the back, remove the sinew, introduce the carbolic acid and soap, and a piece of string about the size of the sinew, sew up the opening carefully, and coat the whole bare portion of the tarsus (and tibia where any part of that is bare) with soap.

In many large birds the tarsi are full of marrow. Drill a small hole near the joint, and another near the base (this of course before sewing up the skin). With a bent wire or slip of cane force in through the upper hole and down the tube of the bone a small plug of wool or paper. This will force all the marrow out through the lower hole; then syringe in carbolic acid, and firmly plug the holes. Of course in large birds like these the tibia must be thoroughly cleaned of marrow before re-turning the skin of the leg.

Then the tail remains; press this up firmly inwards, pulling the skin back to its roots, and

take care to remove all fat and flesh about it. When thoroughly clean, saturate in large birds with carbolic acid, and anoint, when that is dry, with the soap; in small birds the soap will suffice.

In all water birds, horn-bills, and in almost all birds shot during the monsoons or rainy season, it is necessary to skin the tail bone low enough down to expose the uropygial glands, which are little yellowish sacs attached to the tail bone; these should be entirely removed, and a little bit of cotton moistened with carbolic acid, filled into the hole made in removing them.

The skin is now ready, but it must here be noted, that, as far as possible, as the skin is being turned back, every particle of fat should be cleaned away from its surface. At times, especially in the case of Pigeons, Cuckoos, Goat-suckers and Water-birds, there is a vast quantity of fat adhering to the skin which it requires a separate process to detach.

For practical work in the field there is nothing for this like plenty of wood ashes; rub these in, and when saturated with grease, scrape the paste thus formed off and add more, and so on till the grease has been entirely absorbed. Where however you are stationary the following will, I think, entail less trouble:—Take some of the bran, prepared as above directed (*p.* 4), heat it in a cooking pot, until it is too hot to bear the finger in it, taking care however to keep it stirred and not to let it burn. Partly fill the skin with this quite hot, pulling the skin together over it, and pressing it on it. In ten minutes turn this all out, and put another lot in if necessary. As a rule

this, twice done, will cause the absorption of all the grease, but under any circumstances repeat the process until the grease has fairly been got rid of.

One thing must be borne in mind, the fat is often retained in its place by an excessively thin membrane, and, to allow of the necessary absorption, this must be lightly scored across and across with a sharp knife, care being of course taken not to cut the real skin which lies under the fat.

The greasy bran need not be thrown away. Pour boiling water on it, the grease will all float on this. Pour it off and repeat the process; then dry thoroughly and the bran is as good as before.

The skin clean, and all the wood ashes dusted out of the feathers with a bit of cotton or a camel's hair brush, it has then to be well anointed with the soap, and cotton wool, or thoroughly *dried* moss, to about the size of the body of the bird, if it is not larger than a kite, filled in; where the bird is very large, as in Pelicans, Adjutants, Vultures, &c., sufficient stuffing only should be filled to give the bird when dry a thickness or depth of 3 to 3½ inches. The cut edges of the skin are then to be caught together by a stout thread run from side to side, commencing at the breast and ending at the vent, and this gradually drawn tighter until the edges truly meet, care being taken that the feathers meet and blend nicely and do not any of them get caught in the thread or turned inwards.

In birds that have naked heads, like Vultures, or any bare skin or cere about the head, I always plentifully moisten this from outside with

turpentine and a little arsenical soap, though not enough of this latter to leave too perceptible a whitewash-looking coat.

When all else is ready, the eye-lids are to be carefully pulled over the cotton wool that fills the orbits (a little being if necessary added from outside) until they are in a perfectly natural position such as they would have assumed, in life, over a half closed eye.

In the case of water-birds, that are very greasy, and have white breasts, it is often most convenient to make the first cut under the wing. This preserves the breast, and makes the bird look better. It is more trouble skinning by an opening in the side, but it preserves the breast from all soils, and saves the risk of having to wash these out with turpentine, &c.

I have given above in detail my own plan of skinning, and this I recommend, but it may not suit every one and therefore I now proceed to quote one which appeared in *The Field*, and which, although of the "rough and ready" order, may find favour with those disinclined to trouble.

"Let the bird get cold, plug mouth, nostrils, and shot holes with wool, and eyes also if wounded, place the bird on his back, head to you, break wing bones near body with hammer. Cut along keel of sternum from chest to vent, insert fingers and separate skin as much as possible from chest, back, and thighs, use sawdust, or some absorbent powder (not flour), to prevent feathers being soiled. Next raise bird on vent, back to you, loosen skin at base of neck and wings, and with strong scissors cut through neck and wings where pre-

viously broken; push skin downwards. Cut through legs, skin round tail, and cut off head and neck in the ordinary way; in the wings, cut along ulna and radius, and dissect all flesh away, but on no account disturb adherence of secondaries, as their proper order can never be restored. Dress with this mixture—Soap 1 lb., Alum, camphor, and lime, 1 oz. each.”

Another method of skinning birds I quote from Gardener's handbook. “Having obtained your owl, or other bird, the first operation is the removal from his body of the skin and feathers; carefully examine the condition of the bird, and having selected the side you wish to expose when set up in the case, lay that side downwards on a table covered with a clean cloth. Then with a sharp knife make an incision about three inches in length in the skin under the wing, taking special care not to injure the feathers or wound the stomach; so as to allow the intestines to protrude. Then dislocate the first joint of the wing, and gradually dress back the skin to the neck, which must also be dislocated. This is best done at the second or third joint of the vertebræ (or back bones), leaving part of the bone attached to the skull. Then insert into the body a small wire hook, which must be fastened to a pendant string. And now, taking the body carefully into the hands, you can proceed to further remove the skin, without soiling or displacing the feathers.

“By thus hanging the body, the operation is quickly and easily performed. Now dislocate the joint of the other wing, and remove the skin

down to the legs, which must be broken at the second joint."

"Great precaution is necessary in detaching the tail from the body of an owl, in order not to cut off the butts of the feathers, which being somewhat loosely attached to the skin, are otherwise liable to drop out, and cannot be replaced. Having so far freed the skin from the body, remove your hook, and fasten it to the neck bones which remain attached to the skin. You can now skin the neck to the ears, which operation requires great care, as in many species of owl the ears or horns are very large, and form distinguishing features in the bird. Skin to the beak, being particular not to wound the eye-holes. Then sever the neck from the head, clean out the brain from the skull, and remove the eyes and all the flesh, leaving the cranium as clean as possible; skin the legs to the toe-nails, clean the leg and wing-bones, and remove all fragments and particles of flesh and fat from the skin, which will then be ready for preserving."

Lastly, there is a very rough method of preserving skins, which I in no way recommend, but only mention because, any native servant can be taught it in an hour, and because where a collector has no time and yet requires to have specimens identified he may usefully resort to it.

Divide the skin of the bird by a straight cut from the chin to the vent; open the skin out, and pulling it gently away from the bird cut the wing and leg bones and tail *inside* the skin where they join the body; turn the skin back over the head, take out tongue and eyes, and cut the

whole back part of the skull away along with the neck and body of the bird. From the skin, which may now be laid out flat, clean all the flesh and fat that remains round the tail and elsewhere, and taking hold of the legs and wings one by one pull them as it were inside out, so as to be able to clean the whole flesh from the bones; wrap a little cotton round the bones, and push them back into their places. If there is any arsenical soap, the whole inside of the skin, especially about the head, should be everywhere anointed with this. If arsenical soap cannot be procured (though any one can make it up for himself), a solution, made by dissolving a dram of corrosive sublimate in a pint of spirits of wine or rum, should be freely brushed over the whole inside of the skin. If even this cannot be made up, turpentine and powdered alum, or even the latter mixed with common black pepper, may be freely rubbed into the whole raw surface. The skin thus prepared may be pegged out with a few pins on a board, the raw surface uppermost, and dried before a fire or in the sun, but if in the sun a piece of muslin should be thrown over so as to prevent flies depositing their eggs on the skin before it is thoroughly dry.

Once dry the skins may be kept between sheets of coarse native paper, two or three sheets between each, to prevent their greasing each other, in a tin box, with plenty of camphor or powdered pepper and tobacco for almost any number of years, and skins thus prepared, although unsightly till made over to a professional taxidermist, can, if care be taken, be set up at home, almost as well as if they had been scientifically skinned.



5.—*Sexing birds that have been skinned.*

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It is very important to make certain of the sex of every bird that is skinned ; this can only be done by dissection, for even in birds in which the plumage of the sexes usually differs widely, barren females in some species often assume the male garb, and males in many genera after the breeding season are found in the dress of the female.

Take the skinned body of the bird, hold it back uppermost, with the tail from you, cut the back bone through with a pair of scissors at the small of the back, and with a cut on each side in continuation of this first cut divide the muscles, bones, &c., of the sides. The whole frame work of the body will thus be cut through except in front, and the contents of the cavity of the body will remain untouched. Holding the bird still back upwards, and tail from you, take hold of the backbone just below the cut and lift it up, a little force will be requisite in large birds, but that is all. Thus lifted, you see the inner surface of the backbone with the kidneys, &c., attached, quite clear of the entrails, &c., which remain resting on the inner surface of the breast-bone. Just below the cut end of the backbone, attached to the back, one on each side of the bone, but one a little higher up than the other, you will see, in the male, the testicles, and a trifle lower down, over the bone, you will, in the female, observe the ovary.

The testicles in the male are, in the breeding season, large and conspicuous projecting knobs,

spheroidal or ovoidal, of a yellowish white appearance. In birds no larger than a Martin I have seen them bigger than a large pea. But in the young, and even in adults in the non-breeding season, they are small and inconspicuous, black, red or greenish, no bigger than pin's heads, but still in almost every case, if the bird is uninjured in those parts by shot, clearly distinguishable. The ovary is a very thin membranaceous sac, usually dotted with eggs, from the size of a grain of sand to that of peas, according to the season of the year and the age of the female. In young virgin females the ovary is a mere film, very difficult indeed to distinguish in small birds. In these, however, the absence of the testicles leaves no doubt as to the sex.

If any one, with these instructions, will open half a dozen male and female sparrows, minahs, or crows, when they are breeding, he will at once realize the internal distinction of the sexes, and thereafter be able to detect these where they are less marked. Sometimes these parts are covered with clotted blood; no attempt should be made to remove this with knife or scissors, as the delicate reproductive organs may thus be mutilated so as to be undistinguishable; all that is needful is to syringe gently with lukewarm water till the parts are clearly visible.

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#### 6.—*Putting up and drying skins.*

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The skin ready, whatever the process (except that mentioned at p. 32) adopted, the bird (its ticket

having been tied on to its feet) has now to be put up for drying. For all birds not bigger than a goose, all that is necessary after seeing that the feathers are smooth and the wings in their proper places, is to make a cone (using one or more pins) of paper, silver or whitey brown for the small ones, newspaper for the others), suited in size and shape to the bird. Long and narrow, for a long thin bird, short and broadening rapidly for a *stumpy* one. The cone laid in front of the bird, this latter is to be pushed steadily head foremost into it care being taken that the wings lie flat to the sides, and that the points of both come down to exactly the same level, and fall short of or exceed the end of the tail by just as much as they did in the unskinned bird. Of course care must be taken that the head goes in straight, and does not get twisted; and here I may note that when tow only is used for the neck without a stick, it must not be twisted into a hard rope, as otherwise in the process of drying it will untwist, and in so doing twist the neck.

The bird is to be pushed into the cone, as far as by gentle pressure it will go; it must not be pressed very hard, as otherwise the skin of the back will get creased. The lower part of the cone has then to be gathered in round the ends of the wings and tail.

A plait or fold is made in the centre, which is doubled over right or left, and plaits, at each side, which are doubled up over the centre one, and all secured by a single pin. With a little practice birds so put up will dry in such a manner that when taken out they look for all the world like

freshly killed specimens. In making the cone, and in folding the plaits of course some regard to the natural shape of the bird must be had, and to prevent the tail feathers being too tightly papered in, &c.

Where the feet are rather large, it is as well so to cut the paper, after pinning up the plaits, as to allow the feet and tarsi to be *outside* while all the rest is covered.

In the case of very large birds it is always best, where possible, to let them dry for one or two days (according to the heat to which they are exposed) with their wings open beside them, so as to allow their sides and the insides of their wings to part with most of their moisture before they are pressed together. Otherwise these parts not unfrequently rot. Where however this is not possible (and where travellers are concerned it often is not so), before putting them up in their cones, a pad of cotton wool wrapped in 3 or 4 folds of blotting paper should be placed between the insides of the wings and the upper part of the breast, which they would otherwise be pressed directly against.

For large birds strong brown paper makes the best cones.

Very large birds, such as the Sarus, Pelicans, Adjutants, &c, should not be allowed to dry, stretched out at full length. In the case of Pelicans (instead of making use of a cone of paper), a thin cloth answers best for pinning them up in; the neck (in which no stick should be inserted) should be bent round, so that the head lies alongside one of the wings. In Adjutants the same may be

done, and in these and the larger Cranes, the long legs should be bent upwards from the joint, so that the feet rest on the middle of the breast. Care must however be taken that the tarsi and feet lie *outside* the cloth or paper in which the body is pinned up, and that a sufficient number of folds of paper or cloth intervene, to prevent the grease, that despite every precaution will, *at times*, ooze from the feet and legs in drying, reaching to, and soiling the feathers.

For very large birds, the hollow skin system (using bran) may be adopted, or if this is not convenient, the skin may be filled with dry straw, and when the specimen is dry this can be withdrawn. In very large birds any stuffing so much increases the bulk, weight, and difficulty of packing the specimen, that some hold that even if made use of to facilitate the drying, it should be withdrawn when this is accomplished, and the whole inside thoroughly bedewed with turpentine. Stuffing, especially in large birds, Colonel Tytler used to say, is only a bed for insects to hatch their eggs and breed in.

For my part I do not like these hollow skins. They cannot be handled without danger of tearing them; they never look well, and are a bother in many ways. I prefer filling in about 3 inches of stuffing, and drying the bird comparatively flat, with the wings flat also, projecting 3 or 4 inches on either side of the body; the neck in Adjutants, Pelicans, and the like bent round, so that the head and part of the neck lies on the lower surface of the wing parallel to the body, but, while drying, protected from touching either

body or wing by paper and a good layer of cotton wool.

The feet of large birds should invariably be left outside the paper, but every other part should be closely covered in, and no aperture left by which blue bottle flies can find their way in, as otherwise they will, in warm climates or weather, lay thousands of eggs in a very brief space of time in and about the skin, which in two days will swarm with maggots, and although these do no great harm in a thoroughly poisoned skin, they are better avoided. For this reason a thin net veil or sheet should always be thrown over birds when put out to dry before being papered up.

Of course for drying a good hot sun is the best, and the birds well papered up and laid in the sun, especially if placed on sheets of tin, will dry very rapidly: of course they must not be put out where ants or termites can get at them, or these, despite arsenical soap and carbolic acid, will not always spare them; nor must they when brought in in the evening be left about where rats or cats can possibly find their way, or these will utterly *destroy* them, though they cannot *eat* them. There is no knowing, too, where rats, cats, &c., will *not* (at least in India) find their way, and the *only safe plan*, as I know by sad experience, is invariably to have the drying birds shut up in a tin box directly they are brought in, and left there till they are required to be taken out next morning.

Sun heat is not always, however available; in the rains, in damp parts of the country, skins must be dried artificially, or they rot and the

feathers fall off; the best plan is to hang the large ones in their cones, head downwards, by strings in front of a fire, so that they can go on turning and twisting all day and night; while the small ones, also of course in their cones, may be pinned head downwards to the bottom of an ordinary portmanteau tray, a light frame work of wood, with a bottom of cross tapes, and stood in front of the fire, one day front foremost and the next back foremost. Where no fires are kept burning for other purposes, the big birds must be laid on trays similar to that above described over a charcoal brazier, near enough to be well dried in two or three days, but not near enough to scorch the paper, and the trays of small birds, one above the other, can be similarly dealt with, the uppermost today being the undermost tomorrow, and so on.

There is another very effective way of drying skins. Fill a tin box, long enough to contain the specimen, about 2 inches deep, with hot prepared bran, lay the specimen on this (brought of course to a level surface) on its back, and then heap hot bran over the specimen to a depth of three or four inches. Close the box. In one hour repeat the process. Three or four repetitions will dry most birds in the dampest climate, and even in the case of the largest birds, by putting them in with the wings open for the first two or three times, twelve hours will completely dessicate them. In wet weather and damp climates this plan will be found invaluable, and I may here mention that in this as well as in every case in which I have recommended its use, the prepared bran will be found to answer

far better than either the sand or the Plaster of Paris commonly used.

It is however to be born in mind, that skins rapidly dried by artificial heat give great trouble when it is desired to mount them; it is much more difficult to relax them, and they are terribly apt to tear. I cannot explain this, but it appears to be the fact, and rapid dessication by strong artificial heat should, *as far as possible*, be avoided by any benighted individuals who wish to have their birds *mounted*.

Where it is really an object of importance to prevent specimens taking much room, and where the weight of specimens is a matter of great moment, the best way to treat the prepared skins is as follows:—Instead of filling in with *cotton* fill in with bran (prepared as already described) well heated, letting just so much run into the neck as is necessary to give the proper shape, and similarly dealing with the body. When the bird is dry, (and thus treated it dries very rapidly), the whole of the bran\* can be shaken out through a small opening to be made in the sewing near the vent. The skin is thus left perfectly hollow, and presses flat easily and without injury. Skins thus treated pack fairly well, and are much lighter to carry; they are also more easily secured against the attacks of insects. There is no *bed* of cotton in which eggs can be laid and hatched. Turpentine destroys all insects and their ova, and on the slightest suspicion of insects in these hollow skins,

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\* Hot sand may be substituted; but birds thus treated with sand cannot be carried even for a day, and it is so heavy that it is apt to distort the skin—always use the prepared bran if possible.



all that is needful is to pour a few spoonful into the interior and shake the skin well about until the whole inner surface has everywhere been well laved with the spirits. At the same time I do not now advise any one to resort to the hollow skin system when they can avoid it; as I have already stated, they tear, they are awkward to examine, they crease up, get their feathers bent and never look so well as moderately stuffed ones.

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7.—*Cleaning and removing grease from skins.*

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At times valuable skins are so bedaubed with blood or fæces as to appear scarcely worth keeping. Nothing, however, is easier than to clean off every vestige of such stains. Wash the soiled feathers (the whole skin if necessary) freely and boldly in pure water, changing this latter as soon as it becomes at all dirty, until the feathers are *quite* clean. Care must be taken not to break the shafts, but otherwise the feathers may be washed as if they were old rags. The feathers cleaned, they are to be dried. This is done (after gently squeezing the skin once or twice in a clean towel), by using clean, thoroughly washed sand or some of the prepared bran, *well heated*, and dusting this freely on to the wet feathers which are to be kept constantly in agitation; fresh and fresh dustings being applied until, under the influence of the heat thus communicated and the absorbing action of the sand or bran, the feathers dry thoroughly and expand, looking as if they had never been in the least soiled. All that

is necessary to secure success is to wash out every particle of the gummy matter of the blood, &c., and to keep the feathers in gentle but unintermittent motion throughout the drying process, so that no two can dry, stuck together.

Despite all care, the feathers near the edges of the cut will sometimes in stuffing get greasy; and at other times in birds which have much marrow, which one has forgotten to remove, this will exude through a shot, hole, or crack, and thus stain and grease the plumage.

Grease can be easily removed; one way is this, take rectified spirits of turpentine, and with it, with clean rags, thoroughly wash the greasy feathers, rubbing them well, but taking care not to break the shafts. The turpentine dissolves the grease, and when it is found that this has been removed, it is only necessary to allow the feathers to dry, if the turpentine is pure, by themselves, simply allowing it to evaporate, and if not quite pure, keeping the feathers continually but gently agitated with a netting pin, or long needle, so that, owing to any varnish like residue of the turpentine, the webs do not adhere to each other in drying.

Grease may be thus removed, and the feathers so dried that it becomes impossible to discover any trace of either the grease or the removing operation, but where large portions of the skin are greasy a better plan is this. With good white English bar soap (*not* native soap or yellow or brown or scented soaps) make with warm water a very thick lather, a saturated solution of the soap in fact. Into this plunge your

bird. Leave it in this for 6, 12, or 24 hours, according to the extent of the grease, taking care that the skin keeps under the solution and does not float above it.

In some sea birds, carelessly preserved, the grease soaks out and sticks the feathers together in a yellow hard mass that no amount of soaking in the soap solution will soften. In such cases drench with turpentine to soften the grease before placing in the lather.

After the soaking pour the lather off, and pour in lukewarm water. Let it stand for a few moments, very gently agitating the bird. Pour the water off, and repeat the process 10 or 15 times until the water comes away perfectly and entirely pure without *a trace* of soap, and until no smell even of soap remains about the skin. Then lift it gently out, lay it on a clean towel and squeeze gently; repeat the process on another towel and dry, as elsewhere directed, with hot sand or the hot bran, keeping the feathers all the while gently agitated, much as a hen does hers, when she is "bathing" in sand. Of course before washing after this fashion in soap, all stuffing of cotton, moss or the like should be removed from the skins, and when the feathers are nearly dry, clean stuffing can be replaced.

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8.—*Methods of preserving birds without skinning them.*

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It is not absolutely necessary (although it is certainly the best plan) to *skin* birds in order to

preserve them. Take strong spirit, and dissolve a little corrosive sublimate in it, say about one drachm in a quart of the spirits. Dip a black feather in the solution, leave it in for about half an hour, take the feather out and dry it; if when dry the least white deposit is left on the feathers, the solution contains too much corrosive sublimate, and more spirit must be added, until no deposit is left on the feather used to test the strength of the solution. When the solution is of a proper strength, small birds, the size of sparrows, may be popped in just as they are, and left to soak for three or four days. They may then be taken out and allowed to dry—the feathers being of course carefully adjusted if they are rumped, but if hung carefully in the spirits by the bill, and then allowed to dry similarly suspended in the sun, no smoothing of the feathers will be necessary, though it *may* be requisite to run one large pin through the wings and body to keep the former in their places. In the case of larger birds, an incision should be made from the base of the sternum to the vent, and through this aperture the whole of the entrails, stomach, liver, &c., removed. Then place the bird in clean water, which change *repeatedly*, until it ceases to be in any way discolored, and all the blood and coloring from the inside has disappeared. Then plunge it in the spirits, and leave it in them, if of the size of a pigeon, for a fortnight at least, and then dry as usual. This system will scarcely answer for birds bigger than pigeons, and in the case of birds bigger than sparrows, it is fully as much trouble as skinning; the only thing gained being

the preservation of the whole skeleton. For humming birds and the like it answers well enough, but the feathers never set quite so well as in a well-skinned specimen. This process comes in very useful, on long sea voyages, in the midst of which one lands for perhaps a single day, and shoots a hundred birds or so; a small cask of rum, with less than a quarter of a pound of corrosive sublimate, will preserve them all from decay, and you can still, if you wish it, day by day take them out of the spirits, and after thoroughly washing them in fresh water, skin them *almost* as easily as if they were fresh, drying the skin afterwards with bran in the usual manner.

I cannot say that I much recommend this system. I have seen it used successfully, but the specimens never look well, the necks are very apt to break off, and after a few years' keeping the specimens become so brittle that they can scarcely be handled.

On the whole, if birds are to be preserved without skinning, I think the carbolic acid process is the best. With care and judgment very beautiful specimens, especially of the smaller birds, with faintly colored stripes about the head, which get dislocated and deranged in turning and returning the skin, may be made by this process, and it is excessively expeditious and easy; but the drawback is that although birds thus preserved *will* keep an indefinite number of years, they must always be most carefully protected against the attacks of insects. They have an especial tendency to become infested with small weevils, and are in every way very much more susceptible to

the attacks of insects than well-prepared thoroughly poisoned skins.

The carbolic acid process may be used for birds of any size. I saw a fine specimen of *Ardea alba*, which captured alive was killed instantly by pouring a wine glass of pure carbolic acid down its throat, and was then hung up by the beak, and allowed to dry, which it did in about a fortnight, without in any way getting bad, but always retaining a sort of rancid ham smell about it. Such a specimen, however, is in a position of unstable equilibrium; it is a mine ready to be exploded at a moment's notice; a single insect getting to it any where, would in a very few days render it absolutely worthless.

There may however be times, on journeys specially, when birds *must* be thus preserved if they are to be preserved at all; this too should be noted that, at any rate during the first week or ten days after the application of the process, in fact until the bird is once thoroughly dry, it is quite practicable to skin a carbolized bird, so that it is possible to go out for a week's expedition, shoot and carbolize four or five hundred birds, and then bring them back and get them skinned at leisure.

Although, therefore, I cannot on the whole recommend the carbolizing of birds when it is practicable to skin them well, the process is yet one with which every ornithologist should be acquainted.

As already noticed, birds of any size may be carbolized, but the process is less applicable to birds above the size of a common Myna.

In carbolizing birds which it is intended to preserve as carbolized specimens, three or four points have to be borne in mind in every case ; first, when the bird dries, and the flesh shrinks, the keel of the sternum would be left standing up in a knife like ridge, which will soon become bare of feathers, by taking the specimen in and out of its case. The first thing, therefore, to do before carbolizing the bird is to break the sternum in thoroughly, as cooks do who wish to make a skinny fowl look plump upon the table. Secondly, the eye-balls will fall in and shrink, and give the head, when dry, a very miserable appearance ; two days after the bird has been carbolized it will be found quite easy to turn the eyeballs out of the socket, and then brushing the inside of the sockets with a little carbolic acid, wool can be filled in to the proper size, and the eye-lids drawn over it in the usual manner. Thirdly, the feet will dry harsh and hard with a great tendency to interfere with the tail ; they will often also become greasy in drying ; the best plan is, to cross the legs and feet, and wrap them both up in a little bit of blotting paper. This will insure their drying without soiling the tail, and in such a position as not thereafter to interfere with the tail. Fourthly, it is difficult to open and measure the wings of carbolized specimens ; to do it properly one has to break the bones of the wings ; this can be safely done when the bird is fresh, but not quite so well when it is dry ; therefore, before a carbolized specimen is dry, always break the wing bone close to the body.

If the bird to be carbolized is not bigger than a sparrow all that is really necessary after firmly

plugging the vent with cotton is (the four points above noted being borne in mind), to hold the bird up by the bill, open the mouth, push a pencil down the throat as far as it can go, to open the gullet, and drop in carbolic acid, 5, 10, 15, 20, 30 drops, as much as will go, due regard being had to the size of the bird, and great care being taken not to allow any to run over the edge of the mouth on to the feathers, as it bleaches some feathers, and injures all. A plug of cotton should then be put into the throat, and the bird hung up for a little while by a pin run through the nostrils to allow of the carbolic acid being absorbed. A couple of hours later, the bird may be placed in a cone in the usual way, and left to dry as usual.

With care the most superb specimens of Humming birds, Sunbirds, Firecrests, and the like may be preserved at the rate of about twelve per hour by this process.

If the bird is larger than a sparrow it is better, though not absolutely essential, to open the abdomen, extract all the entrails, clean the cavity of the body out, and then fill in the cavity with a good lump of cotton wool well coated exteriorly with carbolic acid; the abdomen is then sewn up again, a plug of cotton wool saturated in carbolic acid is put into the throat, and from inside the mouth a small hole is bored into the brain pan, a little carbolic acid syringed through this, cotton wool soaked in carbolic acid placed in the mouth, and the bird hung up as before, and later put up in a cone to dry. Be the bird big or little the four points first noted must be attended to if a good specimen is wanted.



It may be well again to draw prominent attention to the fact that carbolic acid destroys the eyesight, and that the greatest care must be taken not to allow the smallest splash of the acid to get into the eye.

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9.—*Keeping specimens and dealing with infected skins.*

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As to keeping birdskins, no one who values specimens will ever keep them, in India, in any way, but inside closely shutting tin boxes, with lots of camphor amongst them. Moths are the chief enemies of *well* prepared skins, at least their larvæ, small hairy black insects do more damage than anything else. The only preservative against moths is keeping specimens in closely shut tin boxes, or air tight glass cases, and keeping up inside these such an atmosphere of camphor vapour as will repel, or suffocate, any moth that chances to find its way in. Each specimen should be in a paper cover or tube, open at both ends, just tight enough to prevent the birds slipping about in it, and yet not too tight to prevent its being readily pushed in and out, head foremost, without injury to the feathers. The cover should project from 1 to 3 inches beyond the tips of both beak and tail according to the size of the bird. Rather stiff paper (brown is the best, as insects dislike the smell of this) should be used, and this will thoroughly protect the plumage, while it leaves the specimens easy to be got at for purposes of study.

When skins are to be left for several weeks, and, *a fortiori* months, especially *rainy* months, unwatched and unexamined, their covers should be carefully folded down with a double fold at each end and pinned, so that each is hermetically sealed.

Then, even if one bird *does* go bad, the injury will be confined to that specimen; without this precaution every skin in the box will be involved in the common ruin. Usually birds should be looked through once every month, and whenever any relaxation or softening of skin is observed, well dried in the sun, any bird, in which the presence of insects is suspected being at once removed, and any apparent holes or suspected portions well turpented.

This may be done by merely dropping a little out of a bottle on to the spot, or by using one of Rimmel's *Rafrachisseurs* or perfume blowers, which can be purchased for a couple of rupees from any chemist, and which drives the turpentine in a fine spray into the interstices of the feathers and skin. These perfume blowers will be found most useful, as by them a shower of exquisitely fine turpentine spray, sufficient to prevent any insects settling on them for some time to come, can in a few moments be distributed over fifty birds, and that in such minute quantities as to prevent the slightest danger of injury to plumage. When packing birds (of which more hereafter), I always bedew the whole inside paper lining of the box with turpentine discharged from one of these *Rafrachisseurs*, and as the packing proceeds, I give a good shower over each layer. This was the late Colonel Tytler's plan.

To return, if when the apparently affected spot is treated with turpentine insects come wriggling out, the only certain cure is a turpentine bath. Affected birds of small size are best treated by dipping them in bodily into turpentine at once, and then hanging them up in a current of air free from dust. Large birds should be opened, the stuffing extracted, and the skins then soaked for ten minutes and (clean stuffing being filled in) closed and dried.

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#### 10.—*Packing skins.*

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Before packing, birds should always be very thoroughly dried, and a dry day should be chosen for packing them. A single damp bird, shut up in a hermetically-sealed tin with others, contains moisture enough to mildew and injure the whole of them.

Birds should always be packed in air tight cases, and these should then and there be carefully soldered down. Birds pack well in folded cones, similar to those recommended for drying them in; but I think that when it is possible it is always best to pack them in folded and pinned covers, such as I have above described; then if one bird does go bad, or does contain in it, when packed, the larvæ or ova of insects, the damage is confined to that bird.

In packing birds pack them big and little together in horizontal layers, pressing down carefully each layer as it is put in with a steady uniform

pressure ; a piece of board rather less than the size of the box can be used for this purpose.

If the box has far to travel it is essential that it should be crammed ; if only loosely packed, care not being taken to compress each layer as it is put in, the birds shake down in travelling, and empty space is formed, and this enables the birds to grind each other to such an extent as not only to wear through stout brown paper covers but even to rub all the feathers off the skin ; the the great secret is so to pack the birds as to leave them not the slightest play, it being borne in mind that no reasonable amount of steady downward pressure can hurt birds each in its paper case, packed in horizontal layers.

If the birds, thoroughly dry, are carefully packed on a dry day, with plenty of camphor (some add powdered tobacco and black pepper), and the case, well soldered down, is placed in a stout wooden case, well pitched all over, they may be sent a dozen times by land and sea round the globe without fear of injury. For an ordinary journey by land there is no need of "pitching" the outside of the wooden case, but for long sea voyages it is desirable. In nailing down the wooden cases, take care that no nail is allowed to run through the tin case. A single hole thus made will allow free passage of moisture, and lead to the probable destruction of the skins.

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11.—*Points to be noted by the Collector.*

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Of course the proper preservation of skins, even if accompanied by fully filled up tickets, such as I have described above (*vide p. 14*), is only half an ornithological collectors' work. Besides this it is necessary that he should record a variety of particulars, such as will give us some insight into the mode of life and distribution of the birds.

When working the Avifauna of any district the collector should bear in mind the following as some of the more important points in regard to which information is especially desirable :—

1st.—Is the bird a permanent resident, a seasonal visitant, a through passer, or a mere straggler?

If a seasonal visitant, when does it arrive and depart? if a through passer, at what seasons of the year does it pass through the district, and for about how many days at each season is it observed on its passage, and, if this can be ascertained, where does it come from and where does it go to? if a mere straggler, has it a greater tendency to appear at one season than another, and if so what season, or do its appearances seem to be connected with any meteorological phenomena, *e.g.*, does it appear in exceptionally cold or exceptionally hot weather, or after great floods, or in long continued droughts, or after a long continuance of particular winds?

2nd.—What is the distribution of bird horizontally and vertically in the district, generally, if season make no change in the localities affected,

otherwise in each season? Under horizontal distribution I here include the nature of the localities it affects, distinguishing lakes, rivers, swamps, and marshes, deserts, dry bare uplands, low richly cultivated lands, high forests, scrub and bush jungle, grass jungle, and the like. By vertical distribution I mean the elevations above and below which it is not found.

3rd.—Habits, specially whether it is nocturnal, diurnal, or crepuscular, its mode of life, and food.

4th.—Nidification. Into the points more particularly to be noted here I have entered fully when dealing of eggs further on (*see p. 70*).

Of course no collector can hope to be able to furnish all this information in regard to many species, but what he has to aim at is to record everything he possibly can that will help to throw light on each and all of these questions, and in order to enable him to do this to any real purpose he must keep a ledger instead of a diary journal. From a diary journal, where all that is observed each day in regard to every species seen is lumped together with notices of scenery, lengths of marches, and the like, it is the work of hours to pick out at any time all the facts already on record in regard to any one species. No field naturalist can ever be thus perpetually referring, and yet without it he can never know how far he has already completed his information, or what the special points are in regard to which further observation is most needed; moreover, if he wishes at any time to publish the results of his work, the compilation of the essential facts, the ledgerizing the diary in fact, will occupy

months, and perhaps at the end, owing to his never having known exactly what he had and what he had not recorded, will prove the reverse of satisfactory.

In a ledger journal one, two, or more pages are allotted to each species as it is obtained, and thereafter, whenever and wherever the bird is observed, everything that has to be recorded in regard to it is entered in those allotted pages, so that at any moment the collector can always ascertain all that he has on record in regard to any particular species. The ledger journal is quite as easy to keep up as a diary, and it is impossible to overrate the superiority of the former over the latter.

Of course, besides the ledger a small diary may, if necessary, be kept up on the march as an itinerary, and for the record of observations in regard to the physical features of the country, but nothing in regard to individual species should be entered in this.

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## II. Eggs.

### 1.—*Collecting Eggs.*

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Eggs are *worthless* for scientific purposes, unless the species of the parent bird to which they belong has been determined with *certainly*.

It is impossible to impress this too strongly on all who collect eggs. It is not sufficient that a native who brings the eggs asserts that they belong to such and such a bird. Habitually native

fowlers lie even when they have nothing to gain by it, and even in the case of that *rara avis*, a shikaree who is anxious to be truthful (and no such specimen has ever yet come under my observation), he could never possess the scientific knowledge of birds necessary, in many cases, to make certain of the particular species to which any given egg belongs. For a dozen different species, especially of the smaller passerine birds, native fowlers usually have but one name; nay more, they continually fail to perceive that these are not all identical, even when laid together before them. In the case of Europeans even, unless they are practised ornithologists, no reliance can in many cases be placed on their accounts of the birds to which the eggs they bring you belonged. They too fail to discriminate correctly, not only between allied species, but even between widely separated genera, calling Eagles, Buzzards; Falcons, Hawks; Herons, Cranes, &c.

It may be laid down as a general rule that, if eggs are to be collected to any purpose, they should be taken from the nest in the collector's own presence, and, unless the species is undoubted, that the old bird should be shot as it leaves the nest, or secured at its nest by horse hair nooses or bird-limed twigs, before the eggs are *touched*.

Of course this rule admits of exceptions; of many birds, such as the Sarus (*Grus anti-gone*), the Bustard (*Eupodotis Edwardsi*), the Water Pheasant (*Hydrophasianus sinensis*), &c., the eggs have such well marked distinctive characters, as compared with any other Indian eggs, *that after taking them once or twice himself*



the oologist may allow his native shikaree to take them; but of many species the eggs so closely resemble each other that where, as often happens, two allied species breed in the same neighbourhood somewhere about the same time, he should see, and if not perfectly certain of the species, secure the old birds in every case.

*To make quite sure beyond any possibility of a doubt of the species to which an egg belongs is a sine qua non. If doubt exists on this point the eggs are useless.* A good ornithologist will be able to identify many species as they leave the nest, though even the most practised hands will often have to secure the bird in order to make certain; but in the case of tyros in the science, they should *always* shoot or catch the parent bird, and if when they have it in hand they entertain *any* doubt as to the species, they should preserve the specimen.

Of course, where possible, the specimen should be properly skinned and poisoned, but many willing enough to collect such eggs, as they happen to meet with, either cannot or have not the time to skin a bird properly. For these the very simple process described on p. 32, that any khitmutgar can be taught in half an hour, is recommended.

*Every skin should have so attached to it that it cannot possibly get loose, a ticket with a number and date (that of finding the eggs), and the eggs belonging to the bird should bear the same number and date.*

Of course one specimen of each species of bird is all that it is absolutely necessary to preserve;

when more eggs of the same species are found they should bear the same number as the former ones, the date only being different.

Some small birds that build in thick grass and others that lay on the ground often cannot be either shot or even seen at the nest. These must be secured either by setting numerous horse hair nooses round the nest, or by putting bird-lime besmeared twigs round or across the nest. Of course in both cases care and judgment must be exercised, or the birds will desert the nest, but generally the services of an Aheria or some other native professional bird-catcher can be secured, and after watching him three or four times no European would have any difficulty in either securing or teaching any intelligent servant to secure, in a similar manner, any old bird required.

Patient, persevering, and regular search is necessary to success in egg-finding. When natives are first sent out to look for eggs they *always declare that* none are to be found; but after going out with them oneself two or three days and searching diligently and *proving* to them that there *are* eggs to be got for the looking for, they can generally, if it be *insisted* on, be got, in time, to find nests of one species or another almost daily. But constant pressure and occasional rewards are necessary, for climbing 20 or 30 trees daily, and plodding about in sun and damp five or six hours a day are a great trouble, and every native will avoid it if he possibly can.

After all, if one is a fixed resident anywhere, it is only the first start that is so difficult; for in looking for one bird's eggs, those of another

are found, and where one nest is found with eggs others are seen in process of construction, which looked at from time to time in due course yield their harvest.

If you desire to have any marked success in egg-collecting you must find out about what time the birds breed in your neighbourhood. A great deal of information on this head will be found in my "Nests and eggs of Indian birds," but in the first place the same species breed at very different seasons in different parts of the Empire, and I have rarely been able to give the season for very many different provinces, and in the second place there are hundreds of birds of whose nidification we as yet know nothing.

Still looking to the family and genus to which the bird belongs, you will generally be able to form some idea, not only of the season, but also of the situation in which any particular species is likely to breed, and on both these points much valuable information may often be gathered from native fowlers. If, however, all these sources fail you, the only way to do is to shoot a specimen of the bird of whose eggs you are in search, from time to time, and by an examination of the sexual organs (*vide supra*, p. 34) ascertain whether they are near their breeding season.

It often happens that when collecting birds you find, on examining your specimens, that all or nearly all are males, and this affords a strong presumption that the females are sitting at the time, and should lead to a special search for the nest, and watch over the males, which at any rate, in the case of most passerine birds, must, if the

females sit close, visit them from time to time to convey food.

Many birds specially affect the use of particular materials in the construction of their nests, and if you know what these are, and the birds are about, you may often discover nests by collecting a heap of the coveted material, and watching the birds as they convey these to their nests. Captain Cock tells me that he has found innumerable nests of Tits and the like, in the Hills, by nailing an old sheepskin to a tree in a locality affected by the birds, and watching them with binoculars as they came backwards and forwards to steal the wool.

Although sent out to look for nests, natives *must never* (except in the case of certain eggs, in regard to which *no* mistake can exist) be allowed to take the eggs. After their day's search they report what they have seen; next morning you ride out, secure or make sure of the parent birds, see the eggs taken, and leave the searchers to look for more nests.

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## 2.—*Cleaning and preserving Eggs.*

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The nest found and the species identified or preserved, and the eggs taken, these latter have to be emptied of their contents.

Eggs should be blown with a single hole, and this no bigger than is found absolutely necessary. This hole should be made in the middle of one side. If the egg be of one color without blotches or spots, then the side with the purest color should be selected, and the hole should be bored

on the opposite side, the object being that when the egg lies in a case with the hole downwards, its best side should be uppermost; similarly, in the case of blotched and spotted eggs the handsomest marked side should be selected, and the hole bored on the opposite side.

To bore the eggs a set of iron drills of different sizes should be made, resembling the countersinks used in centre bits for making holes in iron plates, to admit the heads of screws, only instead of the angle at the point being obtuse (which would bore a broad shallow hole) it should be acute. The form of these drills is shown in the accompanying plate (*Fig. 2*); it is convenient to have four sizes to bore holes,  $\frac{1}{8}$ ",  $\frac{1}{4}$ ",  $\frac{3}{8}$ ", and  $\frac{1}{2}$ " in diameter.

Small eggs, if fresh, can be blown with a hole  $\frac{1}{16}$ " in diameter; eggs as big as a kite may require about  $\frac{1}{8}$ ", and no fresh egg, however large, can ever require a hole more than about  $\frac{3}{16}$ " in diameter. The contents of the largest eggs, such as those of Vultures and Cranes, can, even when the eggs are hard set and ready to hatch off in a few hours, be easily removed with patience by a hole from  $\frac{7}{16}$ " to  $\frac{1}{2}$ " in diameter as a maximum. A little practice will ensure this, and it should always be kept in mind that the smaller the hole the better specimen the egg is.

Having selected the spot for the hole, push a needle or steel pin firmly into it, and enter the point of the drill by the hole thus made. Turning the drill pretty rapidly under a steady but gentle pressure proportioned to the size of the egg and strength of shell, a perfectly circular hole of any required size may be cut, which, as the blowing

proceeds, can at any time be enlarged by the same or a larger sized drill, as the case may be, if found necessary. When the hole has been cut, at any rate in all eggs of the size of a crow's and upwards, it will be necessary to clear away from the hole the lining membrane of the egg, which the drill splits but does not remove. For this purpose a sharp very narrow bladed little penknife should be kept, and with it the whole membrane projecting in front of the hole can be cleared away by gentle drawing cuts. Great care must be taken not to chip the edge of the hole in doing this; nothing looks worse than a ragged hole in an egg.

The hole drilled and cleared, a fine straw about 6 inches long (and every oologist should keep a little stock of these by him), and with an aperture of from  $\frac{1}{32}$  to full  $\frac{1}{16}$ th of an inch diameter (according to size of egg) is to be selected. In the case of all but very small eggs (of which mention will be made further on), the egg is then to be held up about the level of the eyes, with the hole downwards, over a mug or bowl, and the straw being placed just inside the hole, is to be steadily blown through, and where the egg is fresh the whole contents will be ejected in a minute or two. When for the first time blowing eggs, people should be a little careful not to blow in violent jerks, or they may chance to send the whole contents into their own faces, but after a little practice there is no fear of this. Sometimes, even when eggs are not much incubated, the albumen becomes so coagulated that it will not, blow as hard as one may, come out of the hole; in such a case, if while blowing the straw is suddenly with-

drawn, a little of the albumen will follow it, and this repeated three or four times will generally effect a clearance.

Where eggs are hard-set the contents must be removed piecemeal. The hole cut and cleared; if the chick is alive, it must be killed, and this can be best done by placing the egg in quite cold water for a few minutes. When the chick is quite dead, or where incubation has not proceeded so far as to vivify the embryo, as much as possible of the contents of the eggs, some portions of which are generally still liquid, is to be blown out, and then the solid portion is to be cut to pieces and removed. For this purpose two or three little hooks (which can easily be made with sodawater or piano wire), and a pair of very fine pointed slender bladed scissors (embroidery scissors they are called in the shops) will be required; a piece of the flesh is drawn towards the hole by the hook and then cut all round, then pulled a little further, then cut further. With a little practice, the largest chick can be taken out piecemeal from the biggest eggs by a  $\frac{7}{16}$ " hole in less than 5 minutes, though at first starting it may take a tyro nearer 15 than 5 minutes.

Eggs, though strong to resist force from without, yield readily to slight pressure from within, and it is therefore very necessary to be gentle in pulling the flesh up to and through the hole, or the shell will assuredly chip at the edge of the hole. As soon as the egg is emptied it must be thoroughly washed out twice or three times with clean water till quite free from smell. If the egg was addled it should be filled with

water after two or three washings, and allowed to stand full for 12 hours, then emptied and again filled, and so on; in a couple of days the most "stinking" egg shell becomes fairly sweet. Another way is to pour a lot of powdered charcoal into the egg and shake it well so that the whole interior is well coated by the powder, and this in a short time removes all offensive odour. A solution of carbolic acid and water, say one part of the acid to 30 of water, poured into the egg and allowed to remain an hour or two will also remove most effectually all unpleasant odour. Where the hole is large the water can of course be poured in; where small, either fill the mouth with clean water and blow it into the egg, or keep at hand a small tin funnel, with about a  $\frac{1}{8}$ " aperture, through which the water can be readily poured into the smallest hole.

In the case of very small eggs, in which no hole big enough to admit the straw should, if they are fresh, be made, a different plan should be adopted; make a hole of about  $\frac{1}{61}$ " in diameter, hold the egg below the mouth with the hole uppermost, fill the mouth with water, and with a fine straw, the point of which should be held near the hole, blow in to this latter a fine stream of water; this enters the egg, drives the contents out, and after a minute or so the egg will be found competely full of clean water, which can be blown out of the egg, without putting the straw into it, by simply holding the egg up in the usual manner and blowing into it, holding the end of the straw about  $\frac{1}{16}$ th of an inch distant from the hole.



It is essential that all the eggs should be allowed to dry thoroughly before being put away; unless this is attended to, not only will they often acquire an unpleasant smell never subsequently to be got rid of, but they also at times, and especially in the rainy season, mildew internally and thus become discolored. In order to secure their drying they should, after being washed out, be left for an hour or so to drain with the aperture downwards on a cloth, and after this for another hour at least with the hole upwards, so as to allow a free passage of air into the interior.

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### 3.—*Mending and labelling.*

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It sometimes happens that a really valuable and rare egg is broken, either in extracting the chick or by some other accident; in such cases it is quite possible to mend the shell neatly with gum and very narrow strips of strong thin paper, and this should always be done, as even a disfigured egg is better than no specimen at all.

Eggs in which it has been found necessary to make very large holes should always have these covered by circular pieces of tough thin paper. These should be cut so as to overlap the hole at least  $\frac{1}{8}$ th of inch everywhere, and should have a series of little cuts made into them from their margins, towards their centres, along their entire circumference (*as shown in fig. 3*), so as to enable the edges to lay flat on the curved surface of the egg. The paper thus prepared should be gummed

on, and adjusted by gently patting it with a damp handkerchief. Where there is much work of this kind to be done, it is best to keep a sheet or two of thin bank paper ready gummed, and then it is only necessary, when a piece has been cut and prepared, to damp and apply it. Eggs with large holes are very apt to break in packing, &c., but these paper patches strengthen them most effectually, and can, if necessary, be colored when dry so as to be hardly perceptible without close examination.

I should add that where these patches are large they should always be pierced with a fine needle hole to allow of the egress and ingress of air, as otherwise if the eggs are moved from the hills to the plains and *vice versa* the patches are very apt to be blown off or forced in by the change of temperature.

The eggs thoroughly clean and dry, there are next the names, or if these are not known the number (corresponding to that on the ticket attached to the skin of the parent bird), and the date and place of finding to be recorded on them. These should be written in ink very small and neatly on the same side as that on which the hole is; great disfiguring scrawls are to be avoided, and by names must be understood the scientific, and not the popular names. The name, or, as above mentioned, where there is any doubt as to this, the number should be written just above the hole, the month and date on the left, and the year on the right of the hole, while the locality should be written immediately below the hole. As to the locality, if it be a universally known

name like Calcutta, Lucknow, Agra, Delhi, it will suffice to write this. If it be only a fairly well known place, like Muttra, Hansie, Saugor, it will be necessary to add the name of the Presidency, North-Western Provinces, Panjab, Central Provinces, as the case may be, while if the place be one only locally known, the name of the district as well as that of the Presidency must be given, thus, Deobund, Zillah Saharunpore, North-West Provinces (*see fig. 4*).

No doubt, small eggs will require a very fine pen and very minute writing, and the inscription must be made as short as possible; but if eggs are to be kept as a collection, the only safe way is to write on them what is required for identification, since attach labels as you will, these break away from or drop off the eggs, and if you place the eggs in little trays in drawers, with the name, &c., written at the bottom of the trays, either some sudden shake mixes the contents of the trays, or careless people, taking up eggs to examine, put them back in the wrong trays.

If you do not care to have the trouble of writing on the eggs, the only other plan is to keep by you a number of small tin boxes, of sizes, like cap boxes, and to allot one box to each clutch of eggs. You gum firmly a piece of thin writing paper, on to the top, and inside the bottom, of each box, and put a corresponding number on each, so that the lids of boxes may not get thereafter changed. Then when you get a clutch of eggs, after blowing and drying them, you pack them with a little cotton wool in one of the boxes suitable to their size, and record on the paper on the lid the

name of the bird and the date and other necessary particulars.

I supply many people, who collect eggs for me, now-a-days with boxes, and I find the following to be the most convenient sizes : (a) 1·5 inches in diameter and 1·25 in height ; (b) 2·25 in diameter, 1·5 in height ; (c) 3 inches in diameter and 1·75 in height ; and (d) 4·25 in diameter and 3·5 in height. Then, when empty, for carrying about, (d) holds two of (c), which each hold, one of (b), which again holds one of (a).

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#### 4.—*Packing eggs.*

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In packing eggs it should be borne in mind that those of very different sizes should always be kept entirely separate, either in different boxes, or with fixed partitions parting them. If this precaution be neglected, the weight of the larger eggs will crush the smaller and more delicate ones, pack as carefully as you may ; small and delicate eggs should have a box or division to themselves ; Doves, Pigeons, Mynahs, and Crows, another ; Eagles, Kites, and Neophrons, another ; Vultures, Adjutants, and Sarus another.

Cotton wool is the best thing to pack them in ; the bottom and sides of the box should first be lined with a layer of cotton from one to two inches thick, according to the size of the eggs and box. Then a layer of eggs put in, each egg being separated from its neighbours by a strip of cotton wool from  $\frac{1}{2}$ " to 1" thick according to the size of the eggs. Over this layer of eggs should come a

layer of cotton an inch thick ; then another layer of eggs, and so on. The eggs must not be packed too tight, as any jar to the box would then probably break them ; nor too loose, as they would then probably get out of their places, touch and break each other.

I do not recommend large boxes for packing eggs. Small tin boxes to hold from a dozen to fifty eggs, according to size, are best, and then 20 to 50 of these small tins can be packed in a strong wooden box, an inch of saw-dust being everywhere allowed between the tin boxes, and the sides, top and bottom of the wooden case, and every interstice between the tin boxes closely filled up with saw-dust.

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#### 5.—*Record of observation in regard to nidification.*

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Thus much for the collection of eggs ; but to give his labours their full value the oologist should keep a little note book, and in it record day by day all particulars in regard to nests that he finds. I give as an example a literal transcript from my own diary :—

“*February 19th, 1867.*—Found at Rahun, Zillah Etawah, North-West Provinces, a nest of “*Lithofalco chiquera*. It was placed in the fork “of a mango tree, near the top and about 30 feet “from the ground. It was a neat compact struc- “ture, circular, about 14” in diameter and nearly “9” thick ; the lower part of pretty stout, the “upper portion of finer twigs ; the whole closely

“interwoven, but the upper portion especially so. “The egg cavity was about  $5\frac{1}{2}$ ” in diameter, nearly “truly hemispherical, and lined with a quantity “of *khushkhus* or tattey-grass roots, woven in “amongst the twigs forming the sides of the “cavity. It contained four fresh eggs.”

Of course, where the name is not known, the entry would commence “(Date). Found a nest of skin No. (so and so).”

A diary like this infinitely increases the scientific value of an oologist's work, and it is so little trouble and so much methodizes a man's habits of observations that he will find, after keeping a diary like this for a single year, that he knows more of the nidification of birds than he has picked up in half a dozen years, when, although finding the same eggs, he kept up no such record of what he saw. Such notes should be made on the spot, and the memory, unless it is unavoidable, never trusted to for future record.

In keeping up this diary it is well to bear in mind the leading points, which it is desirable to ascertain in regard to the nidification of each species, and to record every fact tending to elucidate these.

These points are:—

1.—DISTRICTS AND PROVINCES IN, AND ELEVATIONS (above the sea level) at which it breeds.

2.—Earliest and latest DATES on which its eggs may be found.

3.—SITUATIONS chosen for nesting, *i.e.*, kind of country in which it nests (*e.g.*, forest, open forest, grass jungle, grassy slopes, bare plains, stony hills, swamps, lakes, &c., &c.)

4.—POSITION of nest—on ground (and if so concealed or overhung or open to view), in holes (and if so in what, and of what kind and size, and whether natural or excavated by the birds themselves), on trees, bushes, amongst reeds, grass, &c., (and if so, at what height from the ground, how placed, how attached, &c., full details.)

5.—NEST, shape and dimensions, internal and external.

6.—MATERIALS, what, how put together, whether lined or not, and if so, with what?

7.—Largest NUMBER of eggs or young ones found in any nest; also smallest number of well-incubated eggs so found.

8.—MISCELLANEOUS. Are the birds polygamous or monogamous, and do they pair afresh each season or for life? How many broods have they in the year? And if more than one, do they rear all in the same nest or build afresh each time?

How often are the eggs laid, one daily or every two days, &c.?

How long does incubation last?

How soon are the young ready to shift for themselves?

Do both parents share in building, in hatching, and in feeding the young?

Do they use the same nest for several successive seasons?

Do they ever take possession of the nests of other birds? if so, of *what* other birds?

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### III. Nests.

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It is very desirable when practicable to collect and preserve nests that will bear removal, and that exhibit any constructive ingenuity or speciality of design.

Every nest that it is intended to preserve should have a ticket firmly attached to it, on which should be inscribed the name of the place at, and the date on which it was taken, and the name of the bird, or if that is not known a reference to the number of the skin of the parent bird. Of course, as in the case of eggs, so in that of nests, it is useless to preserve nests unless you know the name of the bird it belongs to, or can preserve a skin of one of the birds belonging to it.

Besides the date and place, the number of eggs or young contained in the nest, and if the former whether they were fresh, or much incubated should be noted, as also such particulars as to the situation and position in which the nest was found, as I have already recommended for record at pp. 71, 72, *paras* 3 and 4.

The best way of preserving and packing any nest, and the only way in which earthen nests, such as some of our swallows build, can be preserved, is by putting each nest lightly wrapped in soft whitey-brown paper, by itself, into a small box of just the requisite size and filling in sufficient soft moss or cotton wool to prevent its shaking about.

It usually happens, however, especially to a



travelling naturalist, that no such boxes are available; in such cases it is useless to attempt to preserve earthen nests of swallows and the like; with other nests the best plan is to line the cavity carefully with silver or whitey-brown paper, and then to stuff the cavity firmly with cotton wool or moss, so that the nest cannot well lose its shape by moderate pressure, and then wrap the whole nest up in tolerably stiff newspaper, pinning the whole up into a compact packet. Thirty or forty nests thus secured will travel well in any basket or little box, provided only that nothing else is put in with them to crush them. The ticket in every case is to be firmly tied to the nest before the packing commences.

I may again repeat that it is quite useless attempting to preserve straggling stick nests, such as Vultures, Eagles, Kites, Herons, and the like usually construct, or mere pads or heaps of grass, rubbish or dead leaves, such as Cranes, and Waterhens and the like make, or even more carefully made nests like those of the *Pittas*, the materials of which possess no sufficient cohesion to permit of their removal. It is essential that the nest should display some little constructive ingenuity, and that it should be so put together as to permit of its removal and packing, as above described, without injury to its characteristic features.

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## IV. Skeletons.

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The preparation of good skeletons of as many as possible of our Indian birds is a most desirable work, and when horribly mangled specimens of good birds are procured it would be well if ornithologists would try to prepare good skeletons out of what can never make a decent skin. The skin is to be roughly taken off, no bone of course being meddled with, and then as much of the flesh taken off as can be easily got away without cutting any of the bones. Then macerate the skeleton, such as it is, in water, until the remaining flesh becomes soft, and can be easily scraped off; separate the head from the last joint of the vertebral column, and with a wire, or blunt hook, clean the brain out of the brain pan. Then lay the skeleton in clean water, changing this until it ceases to be discolored, carefully removing any tiny particles of flesh that may have been accidentally overlooked.

With boiling water make a saturated solution of alum, and when cool, add an equal quantity of water and half an ounce of common salt to every half pound of alum used in making the solution. This is Mr. Eyton's method, and I now quote his further remarks:—"This solution converts the ligaments into a species of leathery substance, and also destroys the colour of any blood that may have penetrated the bones. The time that is required to effect this varies according to the state and size of the skeleton. If it be clear of blood, twenty-four hours will be sufficient, but

sometimes larger birds, of a bad color, must be kept in the solution nearly a week. When the skeleton is removed from the solution of alum the ligaments will be found to have become much stiffened, though not so much but that the skeleton can be easily put into position. The next step is to wash the skeleton slightly under a tap of water if convenient, or if not in a basin; this prevents the crystals of alum forming on the outside of the bones when dry. It is now ready for mounting, and will be easily brought into the position in which it is wished to be arranged in the following way:—Having fixed the feet to a stand, prepare a flat board, and upon it an upright square or rounded piece of wood, with numerous holes dotted horizontally through it at different distances, in which wire-pegs can be inserted so as to be moveable to different heights. Fasten the second vertebra of the skeleton to the topmost peg with a thread and other parts of the skeleton to such wire-pegs as may be found convenient, according to the attitude necessary. When the skeleton is dry it will merely require to be varnished with mastic varnish, and is then complete. It is generally better to remove the head, for greater convenience in cleansing out the brain; this may be easily fastened on again with a piece of wire.

“The most difficult skeletons to clean are those which have been dried with much flesh left on them, particularly when it has remained on them for any length of time. It is sometimes almost impossible to succeed in bringing the bones of such skeletons to a good color. In this case

macerate the bones first in plain water, and remove as much of the flesh as possible. Then place the skeleton in a strong solution of carbonate of potash, or even, if requisite, in a weaker one of caustic potash, though this only for a very few hours. Remove any flesh that could not previously be taken off, and then macerate it again in water for about twenty-four hours. The treatment is afterwards the same as in that of fresh skeletons. Those skeletons that have been previously slightly macerated will be found to be much more easily prepared than those that have not been dipped in water at all before packing, as in the former case the remaining flesh does not become nearly so hard and impervious to water.

“If travellers who collect skeletons, after removing as much flesh as possible from the subject, would merely macerate it for an hour in water, it would save much labour and time in mounting. It is also as well to leave the large wing and tail-feathers, and the skin of the scalp, on the specimens, in order to assist in identifying the species, where the skins are not transmitted also.”

Care must be taken so to ticket each skeleton that no mistake may occur as to what species it belongs to, and to tie the heads firmly on to the rest of the skeleton.

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## V. Feathers.

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Sportsmen and others often wish to preserve geese, duck and other feathers for pillows, rizaies, &c., and though this is not exactly a portion of an ornithologist's work it may be as well to quote an useful receipt for their preparation which I have found to work *well*.

“Take for every gallon of clean water one pound of quicklime, mix them well together, and when the undissolved lime is precipitated in fine powder, pour off the clean lime-water for use. Put the feathers to be cleaned in another tub, and add to them a quantity of the clean lime-water sufficient to cover them about 3 inches when well immersed, and stir about therein.

“The feathers when thoroughly moistened will sink down, and should remain in the lime-water three or four days; after which the foul liquor should be separated from them by laying them on a sieve. The feathers should be afterwards well washed in clean water, and dried upon nets, the meshes of which may be about the fineness of cabbage-nets. The feathers must be shaken, from time to time, on the nets, and as they get dry will fall through the meshes, and are to be collected for use. The admission of air will be serviceable in drying.

“The process will be completed in three weeks; and, after being thus prepared, the feathers will only require to be beaten to get rid of the dust.”

